FILTERING A WATER SUPPLY

Synopsis of Film

1. The Ohio River—Cincinnati's Water Supply.
2. Sample of Unfiltered Ohio River Water.
3. Pumping Station.
4. Upper Reservoir of Unfiltered Water from the River Showing Mud Deposits on Reservoir Banks.
5. General View of Filtration Plant.
6. Turbines which Furnish Light and Power for Filtration Plant.
7. Filter House and Basins.
8. Bottles of Sand and Gravel, Showing Grades Used in Filtering.
9. Cleaning the Filter.
10. Mixing Chemicals with Water to Collect the Suspended Dirt.
11. Aeration—Lost Oxygen is Replaced by a Water Fall.
12. Filtered Water. Notice Absence of Dirt on Reservoir Walls.

13. Chemist Testing Filtered Water.

14. Specimen Bottles of Water Containing: 1. Raw River Water. 2. Settled Water from Settling Basin. 3. Treated Water After Chemicals have been Introduced. 4. Pure Filtered Water.

FILTRATION OF WATER

THE people of Cincinnati, who are dependent upon the Ohio River for water, had long suffered from epidemics of typhoid fever and other intestinal disorders caused by impure water. The numerous towns and cities along the river near its source contribute each its own amount of sewerage and refuse which, to some extent, found its way into the city's water mains, and disease and death often resulted.

The Cincinnati water filtration plant at California, eight miles above the city, was designed and built to insure a safe and adequate water supply. The "pier intake," a small tower-like building, rises from the river near the Kentucky shore. Water is admitted through six screened gates, each four by six feet. Connecting the intake pier with the pumping station on the Ohio shore is a seven-foot conduit, one hundred feet below the river bed, built through solid rock. This conduit is fourteen hundred feet long, and not only conveys the water to the pumps but also contains the wash-water pipes that control the intake of water.

The pump-house, a circular building, contains a shaft, vertical to the conduit. In this shaft is an elevator for lowering men and materials when repairs and cleaning are necessary. The conduit also may be pumped dry and repairs of any kind may be made. Inside the pump-house are four pumping engines, each 109 feet high. The weight of the machinery on the pump-house floor is over six thousand tons.

From the pumping station the water goes to two settling basins, where the mud and refuse settle to the bottom and

on the concrete at the water line. The construction of these settling basins is quite remarkable. After the excavating and grading had been done a three-foot bed of clay was placed in the basin and rolled. Then a layer of crushed stone was laid upon the clay and on this was placed six inches of concrete, marked into huge hexagonal sections. These layers were covered with asphalt upon which burlap was stretched. Another coat of asphalt was applied and then "hubbed" bricks were laid over all. Finally a cement wash was thoroughly brushed over the tops and edges of the bricks. The reservoirs are thus absolutely water-tight.

The main building of the filtration plant contains the offices, laboratories, filtration beds, chemical house, and heating plant. Near it are the coagulation beds and the filtered water basins. Water comes from the settling basins through floating pipes which are automatically kept three feet below the surface in order that no surface refuse may be taken in. Two sixty-inch pipes conduct the water to the coagulating basins where it is distributed to the different basins by other pipes.

Here sulphate of iron is introduced through an open pipe without any special mixing. The water then passes through a meter to a valve chamber where limewater is added. The lime has been previously dumped into water-tanks and converted into milk of lime. These substances coagulate and form a mass insoluble in water which, in the coagulating basins, removes practically all the sediment passing through from the settling basins. The spongy floating masses seen in the picture of the filtration beds are coagulated sulphate of iron and lime. There are three coagulating basins. The settling basins remove more than half of the matter carried in the water. The coagulation basins remove 30 to 40 per cent. more. The electric power and lights of the plant are furnished by turbines generating 240

horse-power and driven by a thirty-foot fall of water from the settling to the coagulating basins.

The water then flows from the coagulating basins to the filter beds. These double beds are twenty-eight in number each of which has a capacity of four million gallons. As the water filters through the forty-four inches of sand and gravel on the bottom of these beds, the small amount of foreign matter that has remained after the coagulation is deposited on the sand, from which it is removed by washing after the basins have been emptied. The wash-water is forced up through the gravel and sand, and the dirt is gently floated off into troughs along the sides of the basins. The sand and gravel replace themselves properly, the heavier gravel going to the bottom and the sand remaining at the top.

The water now falls to the clear water basin where the absence of mud at the water line can be noted. The fall of water through the air replaces the oxygen which was absorbed by the ch micals used in the coagulating basins.

From the clear water basin the water flows by gravity through a seven-foot brick tunnel to a pumping station in the city where it is forced into the city mains and to the houses and factories of the city.

Close views are given of gravel and sand used in the filter basins. Next is shown the water as it appears in various stages of treatment:

1. "Raw" water as it is pumped into the settling basins.
2. "Settled" water after remaining for a time in the settling basins.
3. "Treated" water after sulphate of iron and lime have been used.
4. "Filtered" water ready for use.

The water is tested for algæ, turbidity, and bacilli. Vegetable growth has caused no serious trouble at the

Cincinnati plant. The turbidity is reduced to less than fifty in one million parts of water. Bacilli have been practically eliminated.

Questions, Topics, Suggestions

1. Show, under glass or microscope, turbid water and water containing animal and vegetable life; also typhoid slide.
2. Explain to class the dangers arising from polluted milk and water.
3. Describe effects and explain methods of pasteurizing milk and distilling water.
4. Why is moving water purer than stagnant water?
5. Have pupils bring reports on water supply of town or city in which they live.

Questions on the Film

1. From which side of the Ohio River was the first scene taken?
2. Is the water in the different basins at the same level? How do you know?
3. Draw a plan of the reservoirs.
4. Describe the interior of the filter house and tell what you saw done there.
5. What causes the loss of oxygen in the water? How is it replaced?
6. For what are gravel and sand used?

7. How are the filters cleaned?

8. Describe the appearance of the water in the filter basins.

9. Describe the appearance of the water after each step in the filtration process.

References

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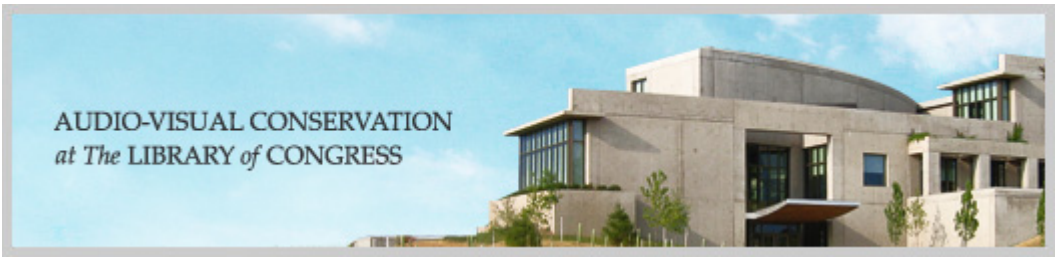

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